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CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT

CD NO.

COUNTRY USSR

SUBJECT Scientific - Radio, vacuum tubes

HOW PUBLISHED Monthly periodical

WHERE PUBLISHED Moscow

DATE PUBLISHED Aug 1950

LANGUAGE Russian

DATE OF INFORMATION 1950

DATE DIST. 26 Feb 1951

NO. OF PAGES 4

SUPPLEMENT TO REPORT NO.

THIS IS UNEVALUATED INFORMATION

SOURCE Radio, No 8, 1950, pp 14-16.

TYPES OF RADIO TUBES NEEDED IN USSR RADIOFICATION

The following letters to the editor were stimulated by A. Baklanov's article "A Survey of Soviet Radio Tubes," published in Radio, No 2, 1950

Letter From B. Mikhel'son, Riga

The questions raised in A. Baklanov's article are of primary importance and should have been considered long ago. The developments in electro-vacuum engineering determine the developments in receiving and amplifying techniques. Hence, we can only welcome discussion of prospective types of vacuum tubes.

Any new tube put out by the industry must possess higher receiving and amplifying qualities than its predecessors. Incidentally, some of our present tubes differ only in their bases or outward appearance. For example, our 6SA7 and 6A10 tubes have the same parameters, but the mechanical features of the 6SA7 are better. Why, then, should the 6A10 be made? Baklanov suggests that it should be continued because it is cheaper to produce, but this is a mistaken viewpoint. This statement also holds for the 6F6M, 6F6S [M means metal, S means glass], 6F6 and 6K9 (the American 6K7).

Why does our vacuum tube industry persist in making the present types of tubes when many of them have poor parameters and are not economical? We must put an end to this abnormal situation. We do not need to get rid of old goods on the shelves as capitalistic countries do. Our industry must manufacture the best types of tubes for each receiver stage and put them on sale in sufficient quantities.

For hf amplification, it is possible to produce better pentodes than the 6K7 and 6SK7 which have too low plate resistance and transconductance. Besides, they are uneconomical. The EF13 and the EF8 noise-reducing hf pentodes are examples of improved pentodes for this category.

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For want of a better tube, the 6A8 is widely used for frequency conversion. Baklanov pointed out many of its deficiencies. The 6A10 was patterned after the 6A8. Although the 6K8 is the best heptode, since its oscillator current is less dependent on the received signal, this type of tube is not manufactured in the USSR owing to its complicated construction.

Our octode is a great improvement on American heptode, but for some reason it is not being manufactured. The best results in the frequency conversion stage, without using a separate oscillator, are obtained with a triode-hexode or triode-heptode. Modern Soviet frequency converters should be of this type.

Our final (output) pentodes, the 6F6, 6P3, 6L6 and 6V6, are also not very good. The 6F6 is generally poor, both in sensitivity and economy. The EL11, EL12 and EL36, however, are considerably better than American output pentodes. An excellent prospective tube could be designed on the basis of these tubes.

The situation is similar in other types of receiving and amplifying tubes.

Our tradition has been to use the greatest possible number of tubes in our first-class radios. However, it would be more interesting and proper for our designers to concentrate on achieving better results with fewer resources. But to solve the problem, we need good modern tubes, and we have a right to demand that our industry produce the best tubes in the world for the "birthplace" of radio.

Letter From N. Smirnov, Kovrov

I agree with Baklanov on the necessity of eliminating such tubes as the 6Zh7, 6K7, 6S5, 6P3, 6F6, VO-230, VO-188, 2Zh2M, and other similar types. But I do not agree with his suggestion to cease production of the 6A8 and 6F5, since they are used in thousands of radios, such as, the SVD-9, 6N1, TM-8, "Pioneer," and 7N-27. It would be impossible to substitute other existing types of tubes without altering the above receivers.

It would be well to improve the parameters of the 6A8, especially to improve its transconductance characteristic but, in my opinion, it would be impractical to eliminate the 6A8 and 6F5.

We must strengthen the insulation between the filament and the cathode of the 30Ts6S kenotron. The tube is not very durable. It is too sensitive to overheating and its emission gives out quickly.

Decreasing the number of types made would, of course, make greater production possible, but any new tubes must be capable of use without extensive modification of existing receivers and amplifiers.

"ECONOMICAL BATTERY TUBES ARE NEEDED"

Letter From F. Filonenko, Stanislav

The proposal to standardize types of tubes and to cease producing obsolete types is timely. Increasing radiofication of the country forces us to re-examine the problem of suitable tube types for future production. The ac tubes are already basically standardized, but not the economical battery tubes. This is a great drawback to rural radiofication.

The popular Rodina radio often gets out of order because of the shortage of batteries and the short life of its tubes. Since the set has no filament rheostat, the emission of the SB-242 tube becomes weak during the very first month of use and then the tube stops working. The radio also consumes too much filament current. The present 1.2-2 v standard for the filament voltage of battery tubes has no justification. If we take as an example a tube which needs 1.2 v for heating, one galvanic cell is not enough. But the use of two cells connected in series results in a power loss of about 50% in dropping resistors.

For the 2-v series of tubes, the use of two cells is admissible at first, but the voltage of such batteries drops rapidly to less than 1 v per cell. A new battery must then be put in or an additional cell must be connected in series. In either case, the battery efficiency is very low. There is also no advantage in supplying these tubes from acid storage batteries, since one cell is insufficient and two cells in series supply too high a voltage.

It is, therefore, necessary to revise the present standard for filament voltage and reduce it to 0.9 v and 1.8 v, respectively, for the two types of battery tubes. The 2-v norm could be maintained if the VD-500 and VDL-3 type dry cells could be successfully mass-produced but the voltage for miniature tubes should be reduced to 1 v.

The output power of receivers should be 0.025-0.5 w while a duo-pentode with an output power of 2-2.5 w should be made for rural battery-operated wired radio centers.

The time has also come to produce "magic-eye" (visual tuning indicator) tubes for battery receivers. These tubes facilitate tuning and do not appreciably increase consumption. They are especially needed for the PTB-47 type of battery receiver for battery wired radio installations.

There is no doubt that the most economical tubes are tubes of the miniature series 1A1P, 1K1P, 1B1P and 2P1P.

To permit multiple use of the tubes (very important in battery radios) we must have a variable mu hf diode-pentode [text not clear whether reference is to multiunit or multipurpose tube]. The group of miniature tubes should include an lf duo-pentode with a power of 0.25 and 2.5 w and also a magic-eye tube.

In my opinion, hf amplification tubes need heater power of the order of 30-40 mw; converter tubes need 70-80, uhf diodes, 30-50 and if amplification tubes, 60-100 mw.

A simple mass-produced radio should use only one filament dry cell with a drain of not more than 0.2-0.3 w. Battery receivers must have filament rheostats. A simple filament voltage indicator should also be made.

It is only by producing economical battery tubes that we can have cheap mass-produced radios with a total power drain of the order of 0.25 w.

Letter From P. Lauta, Babin Sugar Combine, Vinnitsa Oblast

The basic defect of all our radio tubes is low power efficiency, especially in the heaters. The SB-242 frequency converter tube is not only uneconomical but also performs badly, particularly on short waves. Output tubes for battery radios also need improvement.

The minimum output power of the final stage of a battery receiver should, in my opinion, be 0.1 to 0.25 w. This power would permit normal volume and could be developed by a good pentode or duo-pentode.

The previous value of plate voltage--90 to 120 v--must be retained as the optimum voltage, but production of proper plate batteries must be ensured. The output of vibrator-converters and low-voltage alkaline storage batteries must be put on a sound basis. They are needed in conjunction with the many low-power wind-driven installations recently set up in rural districts by radio amateurs. A supply of these devices would enable many amateurs to avoid using plate batteries and galvanic cells.

For preliminary amplification, with a normal (one-tube) output stage, a diode-pentode is needed in which an amplified voltage of the order of 80-100 v is obtained in the pentode.

The best circuit for the driver stage would be a resistance-coupled amplifier. It would be necessary to use a pentode with a power of not less than 0.25 w as an output tube. It would then be possible to introduce controlled negative feedback in the receiver. To use a duo-pentode with a power of about 1 w in the final stage, a diode-triode would be necessary as a preliminary amplifier, in which the triode part would function as a phase inverter.

"DOUBLE-GRID TUBES ARE NEEDED IN RURAL DISTRICTS"

Letter From A. Bychkov, Frolovo, Stalingrad Oblast

Radio has brought up the subject of manufacturing the old MDS (double-grid) tubes with improved parameters and a plate voltage of 10-12 v. We veteran radio amateurs and operators believe that amateur radio activities and radiofication would develop very rapidly in villages if these tubes were put on sale. During World War II, our specialists learned to make the most complicated equipment and tubes. Is it more difficult to make a simple tube with a 1-2 v filament and a plate voltage of 10-12 v?

"THE SUPPRESSOR GRID SHOULD HAVE AN OUTLET LEAD"

Letter From V. Stepanov, Chekmogush, Bashkir ASSR

In general, the conclusions of Comrade Baklanov are correct. But it seems to us desirable that all economical tubes should have suppressor-pin outlets. Structurally, such tubes would be more universal. They would make it possible to design simple new circuits for battery receivers and measuring instruments. They could, for example, be used as frequency converters in very simple superhets or as double-grid tubes in receivers designed for low plate voltage.

The MPSS (Ministry of Communications Equipment Industry) should suggest that plants adopt this type of construction for most tubes, including battery tubes.

We cannot agree with Comrade Baklanov's statement that there is no point in using a visual tuning indicator in battery-operated receivers, to save power. It is quite possible to make a cheap, economical tube of this type which can function as a detector in the regenerative stage or as a first audio amplifier. Under such conditions, this tube would not increase power consumption and it would make it possible to eliminate the neon indicators used in battery-operated radios. It could also be utilized in very simple measuring instruments.

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